

What is claimed:

- 1 1. A method for treating soot-containing exhaust gas with a wall-
2 flow filter comprising the steps of:
 - 3 (i) passing an exhaust gas over an oxidation catalyst disposed on a
4 gas-impermeable zone along the wall-flow filter to convert an amount of NO in the
5 exhaust gas to NO₂, wherein the wall-flow filter comprises a honeycomb arrangement
6 defining:
 - 7 (a) a plurality of first channels plugged at an upstream end, and
8 (b) a plurality of second channels not plugged at an upstream end,
9 but plugged at a downstream end;
 - 10 (ii) thereafter, trapping soot from the exhaust gas in a catalyst-free
11 gas-impermeable zone disposed along the plurality of second channels; and
 - 12 (iii) continuously combusting the trapped soot generated from step
13 (ii) with the NO₂ produced from step (i), wherein the amount of NO₂ generated from
14 step (i) is sufficient to enable combustion of the trapped soot in the catalyst-free
15 gas-impermeable zone disposed along the plurality of second channels plugged at
16 the downstream end at a temperature less than 400°C.
- 1 2. The method according to claim 1, wherein the wall-flow filter is
2 made of a ceramic material selected from the group consisting of cordierite, alumina,
3 mullite, silicon carbide, zirconia and sodium/zirconia/phosphate.

1 3. The method according to claim 1, wherein the plurality of first
2 channels and the plurality of second channels are square, circular, rectangular,
3 hexagonal or triangular in cross section.

1 4. The method according to claim 1, wherein the arrangement of
2 the plurality of first channels and the plurality of second channels is such that
3 laterally and vertically adjacent channels are plugged at opposite ends.

1 5. The method according to claim 1, wherein the honeycomb
2 arrangement further comprises a plurality of third channels which are unplugged to
3 provide a flow-through by-pass to the first and second channels.

1 6. The method according to claim 1, wherein the oxidation catalyst
2 includes a platinum group metal.

1 7. The method according to claim 6, wherein the platinum group
2 metal is selected from the group consisting of Pt, Pt/Rh, Pd/Rh or Pt/Pd/Rh.

1 8. The method according to claim 6, wherein the platinum group
2 metal comprises at least one of Pt and Pd.

1 9. The method according to claim 1, further comprising after the
2 exhaust gas passes through the gas permeable zone of the plurality of second
3 channels, the step of absorbing NO_x with a NO_x absorber disposed along the gas
4 impermeable zone of the plurality of first channels plugged at the upstream end.

1 10. The method according to claim 9, wherein the NO_x absorber is
2 selected from the group consisting of an alkali metal, alkaline earth metal, rare earth
3 metal, and mixtures of any two or more thereof.

1 11. The method according to claim 9, wherein the NO_x absorber
2 includes an oxide of at least one of an alkali earth metal and an alkaline earth metal.

1 12. The method according to claim 11, wherein the alkali metal is
2 potassium, sodium, lithium, rubidium or caesium or a mixture of any two or more
3 thereof, the alkaline earth metal is barium, calcium, strontium or magnesium or a
4 mixture of any two or more thereof.

1 13. The method according to claim 8, further comprising after the
2 step of absorbing the NO_x, the step of reducing NO_x with a reduction catalyst or a
3 Selective Catalytic Reduction (SCR) catalyst disposed downstream of the NO_x
4 absorber along the gas impermeable zone of the plurality of first channels plugged at
5 the upstream end.

1 14. The method according to claim 13, wherein the step of reducing
2 NO_x is through use of the reduction catalyst

1 15. The method according to claim 14, wherein the NO_x reduction
2 catalyst comprises at least one platinum group metal.

1 16. The method according to claim 13, wherein the step of reducing
2 NO_x is through use of the SCR catalyst

1 17. The method according to claim 16, wherein the SCR catalyst
2 includes copper-based materials, Pt, a mixed oxide of vanadium and titanium or a
3 zeolite or mixtures of two or more thereof.

1 18. The method according to claim 16, wherein the SCR catalyst
2 comprises $V_2O_5/WO_2/TiO_2$.

1 19. The method according to claim 1, further comprising before the
2 step of passing the exhaust gas over the oxidation catalyst, the step of absorbing
3 SOx on the gas-impermeable zone along the plurality of second channels.

1 20. The method according to claim 19, wherein the SOx absorber
2 includes an alkaline earth metal oxide or alkali metal oxide or mixtures of any two or
3 more thereof.

1 21. The method according to claim 20, wherein the alkali metal is
2 potassium, sodium, lithium, rubidium or caesium or a mixture of any two or more
3 thereof, and the alkaline earth metal is barium, calcium, strontium or magnesium or
4 a mixture of any two or more thereof.

1 22. The method according to claim 1, wherein the wall-flow filter
2 further comprises a high-surface oxide support comprising alumina, titania or
3 zirconia for supporting the oxidation catalyst.

1 23. The method according to claim 19, wherein the support
2 supporting the catalyst renders the zone including the oxidation catalyst substantially
3 gas impermeable.

1 24. The method according to claim 1, further comprising increasing
2 the local pressure drop of the wall-flow filter by a factor of at least 2 with the
3 presence of the oxidation catalyst.

1 25. The method according to claim 1, further comprising increasing
2 the local pressure drop of the wall-flow filter by a factor of at least 10 with the
3 presence of the oxidation catalyst.

1 26. A method according to claim 1 for treatment of soot-containing
2 exhaust from a combustion engine.

1 27. A method according to claim 1 for treatment of soot-containing
2 exhaust from a diesel engine.

1 28. A process for treating soot-containing exhaust gas comprising
2 the steps of first passing the soot-containing exhaust gas over an oxidation catalyst
3 to convert NO in the exhaust gas to NO₂, then filtering the gas to deposit soot on a
4 filter disposed in an exhaust system of a combustion engine wherein the exhaust gas
5 containing NO₂ is used to combust the soot trapped on the filter, the amount of NO
6 converted to NO₂ being sufficient to enable combustion of soot trapped on the filter
7 to proceed at a temperature less than 400°C, wherein the filter is a wall-flow filter
8 comprising: a honeycomb arrangement defining a plurality of first channels plugged
9 at an upstream end and a plurality of second channels not plugged at the upstream
10 end but plugged at a downstream end; the oxidation catalyst on a substantially gas
11 impermeable zone at an upstream end of the second channels; and a catalyst-free
12 gas permeable filter zone downstream of the oxidation catalyst for trapping soot.

1 29. The method according to claim 28, for treating exhaust gases
2 from a combustion engine.

1 30. The method according to claim 28, for treating exhaust gases
2 from a diesel engine.